

111601
SHAUGHNESSEY NO.

REVIEW NO.

EEB BRANCH REVIEW

DATE: IN 5/22/84 OUT JUL 20 1984

FILE OR REG. NO. 707-145, 707-174

PETITION OR EXP. PERMIT NO. _____

DATE OF SUBMISSION 5/17/84

DATE RECEIVED BY HED 5/21/84

RD REQUESTED COMPLETION DATE 7/30/84

EEB ESTIMATED COMPLETION DATE 7/23/84

RD ACTION CODE/TYPE OF REVIEW 315/Amendment

TYPE PRODUCT(S): I, D, H, F, N, R, S Herbicide

DATA ACCESSION NO(S). _____

PRODUCT MANAGER NO. R. Mountfort (23)

PRODUCT NAME(S) Goal 1.6E: 707-174

Goal 2E: 707-145

COMPANY NAME Rohm and Haas Company

SUBMISSION PURPOSE Proposed registration of forest use:

weed control in conifer and hardwood plantings

Field Study DER attached

SHAUGHNESSEY NO. CHEMICAL, & FORMULATION % A.I.

111601 Oxyfluorfen _____

(1)

Goal100 Submission Purpose and Label Information100.1 Submission Purpose and Pesticide Use

Goal 1.6E and Goal 2E are Herbicides. In this submission, Rohm and Haas Company proposed to register both these herbicides for use as weed control in field establishment of conifers and hardwoods.

100.2 Formulation Information

Goal 1.6E is 19.4% Oxyfluorfen. (1.6 lbs a.i./gallon)

Goal 2E is 22.6% Oxyfluorfen. (2 lbs a.i./gallon)

100.3 Application Methods, Directions, Rates

Apply Goal 1.6E at 5 to 10 pints (1 to 2 lbs a.i.) per acre for preemergence and postemergence weed control.

Apply Goal 2E at 2 to 4 quarts (1 to 2 lbs a.i.) per acre for preemergence and postemergence weed control.

The labels do not mention number of application per season but Thomas Rogerson of Rohm and Haas Company suggested there could be 2 applications per season and it could be used for up to 2 years. He also said the general label prohibits aerial use. Both of these points must be specifically mentioned in the label. I will request that the label limit treatment to two applications per season and limit application to ground vehicle only.

100.4 Target Organisms

Grasses and broadleaf weeds

100.5 Precautionary labeling

Do not apply directly to water. Do not contaminate water by cleaning of equipment or disposal of wastes.

This product is highly toxic to aquatic invertebrates, aquatic plants, wildlife and fish. Use with care when applying in areas frequented by wildlife or adjacent to any body of water or wetland area. Do not apply when weather conditions favor drift or erosion from target areas.

101 Hazard Assessment101.1 Discussion

Goal is presently registered for many crops involving substantial acreage. It is used on orchard type sites such as almond, apricot, cherry, fig, nectarine, peach, pear, pistachio, plum, prune, walnut and grape. It is used on corn, cotton, spearmint and peppermint, and soybeans. It is registered for use on conifer seedbeds, transplants and container stock.

This new use is called weed control in field establishment of conifer and hardwoods. Preemergence applications would be made immediately after conifer or hardwood seedlings have been transplanted to a forest site. Preemergence applications could also be made to established conifers or dormant hardwoods. Postemergence applications may be made to conifers after the new growth has had an opportunity to harden. So it is apparent that any one area could be treated several years in a row, that is, the year the seedlings are planted and up to 2 years or so afterwards to control weeds, at least in conifer reforestation. The limiting factor would be the cost of the herbicide.

According to the Symposium on the use of Herbicides in Forestry, February 21-22, 1978 at Crystal City Marriott Hotel, sponsored by USDA and USEPA, vegetation is managed for forestry establishment on no more than 400,000 acres per year. Note that most of this is non-chemical control. This is not an extensive annual use acreage-wise compared to the existing use sites.

Herbert Knight, Assistant Manager of the North Carolina Forestry Survey Unit (8-672-0616) provided the following information.

In the southeastern states (VA, NC, SC, GA, FL)

87,000,000 acres commercial forests

12,000,000 acres forest plantations

500,000 acres artificially regenerated annually

In the midsouthern states (TX, OK, AK, LA, MI, AL, TN)

97,000,000 acres commercial forests

7,000,000 acres forest plantations

600,000 acres artificially regenerated annually

Presumably not all of the artificially regenerated (planted) forest acreage would be treated with oxyfluorfen. The above sources are considered roughly consistent showing that substantially less than 1 million acres would be treated with Goal annually.

101.2 Likelihood of Adverse Effects to Non-target Organisms

The EEB considers this proposed use, field establishment of conifers and hardwoods, to be an incremental increase in exposure to nontarget organisms over Goal's existing uses. Although this use does not involve substantial acreage, it is a significantly different use compared to agricultural crops. It presents the possibility of exposing new nontarget populations to oxyfluorfen. Furthermore, it is possible that within a 20 to 40 year growing cycle that half the 19,000,000 acres of forest plantation in the south could be treated thus exposing a significant number of new nontarget populations to oxyfluorfen.

Toxicity

Oxyfluorfen is highly toxic to upland gamebirds and no more than slightly toxic to waterfowl. It is practically non-toxic to mammals. Oxyfluorfen is highly toxic to fish and moderately toxic to aquatic invertebrates. It will not affect avian reproduction at 100 ppm; the fish MATC is >38<74 ppb.

Terrestrial Exposure

According to the nomograph entitled "Maximum Expected Residues on Vegetation" developed from various sources including Kenega, 1973, applying 2 lbs. a.i. per acre could result in the following residues (ppm):

short range <u>grass</u> 480	long <u>grass</u> 220	leaves leafy <u>crops</u> 250	<u>forage</u> 116	seed <u>Pods</u> 24	<u>fruit</u> 14
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The value for residues on short range grass exceeds the avian dietary LC50 (bobwhite quail LC50=390 ppm). However, none of the other residues do. These residues are worst case estimates with most actual field residues being much lower. Furthermore, short grass and leaves are not the usual food for upland gamebirds. None of the estimated residues would be high enough to adversely affect mammals. This proposed use of Goal herbicide is not expected to have an adverse effect on terrestrial wildlife.

Aquatic Exposure

The field residue monitoring study showed that up to 4 months after a single application at 0.5 lbs./acre the residues in pond sediment ranged between 20 and 40 ppb. It is difficult to interpret the results because pertinent information about the study is lacking. But the reviewer assumes that samples taken shortly after application would have shown higher levels, at least twice as high because 4 months is longer than the chemical's halflife. If those values are then modified based on present proposal conditions, the level could be 8 times higher shortly after application.

40 ppb measured after 4 months
 X2 because half the original residues probably degraded
80 ppb shortly after application
 X4 proposed application rate is 4 times that in study (0.5 vs 2)
320 ppb expected sediment residues shortly after application of
 2 lbs. a.i./acre

Whether this proposed use would result in higher residues than those shown by the above extrapolation depends on what the erosion potential of the test site was compared to what would be expected of areas managed for field establishment of forest seedlings.

This level, 320 ppb, does not exceed the aquatic invertebrate LC50 of 1.5 ppm. It does exceed the fish LC50 of 200 ppb and the lowest NOEL in the oyster larvae 48-hr LC50 of 3.2 ppb. There is no chronic toxicity test results for aquatic invertebrates but the expected residues exceed the fish MATC of >38<74 ppb.

Assessing the hazard of this use raises questions of safety to benthic organisms including mussels as well as bottom-feeding fish. Data suggest a potential for adverse acute and chronic effects on these animals. These effects would last throughout the seasons in which goal was used but would cease after a few years since a field establishment use is not continual year after year.

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The use of aerial application would add to the potential hazards. Not only could residues enter aquatic habitats via runoff, but also oxyfluorfen could be inadvertently applied directly to water bodies adjacent to the treated areas. This exposure could occur even if the water was buffered from runoff. Oxyfluorfen is highly toxic to aquatic organisms, persistent, and bioaccumulative in fish. Even though the general label states no aerial application, to avoid a chance of direct application to water, the supplemental labeling should include a statement prohibiting aerial application. Furthermore, to reduce chronic exposure the EEB recommends limiting application to twice per year.

101.3 Endangered Species Considerations

This proposed use is not expected to have an adverse effect on endangered bird or mammal species.

The following endangered plant species occur in silvicultural areas and may be threatened by timber management practices.

Chapmans rhododendrin
Haig rattleweed
Persistant trillium
Green pitcher plant
Hawaiian wild broad-bean

The effects to these species and the measures necessary to protect them from goal will be identified in the cluster review approach being developed on forest uses.

Aquatic endangered species especially mussels are of concern considering the potential residue levels based on the field study, the toxicity of oxyfluorfen, and the areas of proposed use. These too will be addressed by the cluster review for forest use sites.

101.4 Adequacy of Toxicity Data

The study that was reviewed with this proposal, the aquatic field residue monitoring study, was validated as supplemental. The information necessary before an upgrade can be considered is identified in the Conclusions of this review. There is enough toxicity data on oxyfluorfen to characterize its toxicity to all animal groups. The supplemental field study showed that under some conditions oxyfluorfen would transport from a treated field via runoff and occur in sediment at toxic levels.

Additional data could show oxyfluorfen to be less of a hazard to nontarget organisms than the present assessment concludes. Such data include an aquatic invertebrate early life stage chronic toxicity test, and studies that show sediment-bound oxyfluorfen to be less toxic in the field than demonstrated in laboratory tests or demonstrate that oxyfluorfen will not occur in the aquatic environment at hazardous levels.

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101.5 Adequacy of Labeling

The hazard statement on the label adequately states the hazards of these uses for Goal.

However, if Goal 1.6 and/or Goal 2E are registered for use in field establishment of conifers and hardwoods, then both supplemental labels should specifically state that the herbicide is not to be applied by air, and that it should not be applied more than two times per year.

The reason for these specific limitations on the Goal 1.6E and Goal 2E label is to minimize exposure to nontarget organisms, (see hazard assessment).

103 Conclusions

EEB has completed an incremental risk assessment (3(c)(7) Finding) for the proposed conditional registrations of Goal 1.6E and Goal 2E for use in the field establishment of conifers and hardwoods. Based on available data EEB concludes that the proposed use provides for significant increase in exposure to, and in both acute and chronic risks for, non-target benthic organisms including mussels as well as bottom-feeding fish.

Before EEB can conclude the safety of oxyfluorfen when used in the field establishment of conifers and hardwoods, the following must be submitted.

1. An aquatic invertebrate early-lifestage chronic toxicity test; and
2. Either a biological field study, or a field residue monitoring study with laboratory data, showing that this use would have minimal effects to nontarget benthic organisms and bottom-feeding fish when used as proposed.

EEB also wants to emphasize that no hazard assessment was completed on previously registered major crops (including corn and soybeans). The review on these crops resulted in a request for a field residue monitoring study. The study was submitted and validated (6/13/84) by Dan Rieder as supplemental because important data were lacking from the report. We cannot yet complete a hazard assessment on all the major uses conditionally registered: corn, cotton and soybeans. When the necessary information is available, EEB will interpret the field study and assess the hazard for these previously registered uses.

The following information must be made available to EEB for revalidation of the field study:

1. Size of all test fields;
2. Soil type at each test field;
3. Pond size (volume in acre/feet and surface area) at each test site;
4. Application schedule including specific dates for each site.

Topography maps (7.5 minute series) showing each site must be provided as well as photographs of the sites if available. It must be clarified which years Goal was applied to the Quinn farm.

Daniel Rieder 7/20/84
Daniel Rieder
Wildlife Biologist
Section 2

Norman Cook 7-20-84
Norm Cook, Section Head
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David L. Cypher 7/20/84
Clayton Bushong, Branch Chief
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DATA EVALUATION REPORT

1. CHEMICAL: Goal
2. FORMULATION: Oxyfluorfen is a.i. of Goal herbicides

Shaughnessy Number: 111601

3. CITATION: Zogorski, Walter J. 1982. A Study to Determine the Fate of Goal Herbicide in the Environment. Technical Report No. 36H-82-1
An unpublished report prepared by Rohm and Haas company.
Acc. # 246782.
4. REVIEWER: Daniel Rieder
Wildlife Biologist
EEB/HED
5. REVIEW DATE: 6/13/84
6. TEST TYPE: Field monitoring study
7. RESULTS: The field study showed that under some conditions oxyfluorfen will move from a treated site to an adjacent aquatic habitat.
8. REVIEWERS CONCLUSION: This study dose not fulfill the requirements for a field residue monitoring study. There are substantial data lacking and the study cannot be validated until these data are submitted.

INTRODUCTION

This study was requested to determine the fate of oxyfluorfen in the environment after it had been applied to agricultural crops.

METHODS

Six test sites were used; 4 in North Carolina, 1 in Iowa and 1 in Missouri.

1. R.S. Hilburn farm, Wallace, N.C., 40+ acres, field code P-18.
2. J. Quinn farm, Wallace, N.C. 16+ acres, field code D-213.
3. Sharer farm, Oakvill, Iowa, 30 acres field code 218127.
4. S. Tolar farm, Raeford, N.C., field code 479-289.
5. F. Rouse farm, Liddell, N.C., 20 acres, field code 6-75.
6. Salisbury farm, Centralia, MO, field code 608113.

Each field had a runoff receiving pond in close proximity to the treated field.

The distribution of Goal herbicide was determined by measuring residues in samples of water and sediment in the runoff path and in the ponds. The samples were taken periodically throughout the summer of 1981.

Field treatment History:

1. Hilburn farm, P-18
1978-3/4 lb a.i. per acre in 1 application
1979-3/4 lb a.i. per acre in 1 application
1980-3/4 lb a.i. per acre in 1 application
1981-3/4 lb a.i. per acre in 2 applications (0.5 + 0.25)
2. Quinn farm, D-213
1977-1.5 lb a.i. per acre in 2 applications (0.75 + 0.75)
1978-1.25 lb a.i. per acre in 2 applications (0.75 + 0.5)
1979-1.0 lb a.i. per acre in 2 applications (0.75 + 0.25)
1980-0.5 lb a.i. per acre in 1 application
3. Sharer farm, 218217
1981-0.38 lb a.i. per acre
4. S. Tolar farm, 479-289
1981-0.5 lb a.i. per acre
5. Rouse farm, L-75
1981-0.5 lb a.i. per acre
6. Salisbury farm 608113
1981-0.38 lb a.i. per acre

Rainfall:

April	0.85"
May	4.21"
June	0.28"
July	5.56"
August	5.15"
September	2.64"

RESULTS

According to the study, 5 of the 6 test ponds had no residue in the water or sediment. The site, D-213, showed that goal herbicides does leave the field with runoff under what the researcher described as a worse than typical runoff conditions. The residues that did show up in the pond sediment at D-213 were detectable all summer. See the attached tables for results from the report.

REVIEWERS EVALUATION

There is insufficient information in the report to interpret the study results and establish a study validation category. Information which is lacking includes:

1. Size (acres) of all test fields;
2. Soil type at all test fields;
3. Pond size (volume in acre feet) and surface acreage) at all test sites;
4. Application schedule including specific dates

Topography maps (7.5 minute series) showing each site must be provided as well as photographs of the sites if available. The registrant must clarify which years Goal was applied to the Quinn farm. The report suggest that it was only applied up to 1980.

CONCLUSION:

Category: Supplemental

Rationale: Insufficient information

Repairability: The study may be upgraded if adequate information is provided.

TABLE I

Summary of Goal Residue Distribution in
Field P-18 Wallace, North Carolina

Sampling Location	1st. Sampling 4/27/81	2nd Sampling 7/16/81	3rd Sampling 8/10/81	4th Sampling 9/17/81	half life
Field	0.02	0.14	0.10	0.03	30.6
Field Edge	NDR	NDR	0.08	0.02	days
Edge Pond	0.02	"	NDR	NDR	
Edge Pond	NDR	"	"	"	
Middle of Pond	Not Sampled	Not Sampled	"	"	
Middle of Pond	"	"	"	"	
Pond Water	NDR	NDR	"	"	

NDR = No Detectable Residues
Residues in ppm

Table II

Summary of Goal Residue Distribution in
Field D-213 Wallace, North Carolina

Sampling Location	1st. Sampling 4/27/81	2nd Sampling 7/16/81	3rd Sampling 8/10/81	4th Sampling 9/17/81
Field Edge	0.28	0.03	0.04	0.26
"	0.11	NDR	0.07	0.11
"	0.58	0.01	0.02	0.02
Pond Edge	0.02	NDR	NDR	0.01
"	0.02	"	"	NDR
"	0.03	0.02	"	"
"	0.11	0.69	"	"
Middle Pond	Not Sampled	Not Sampled	0.02	0.01
"	"	"	0.03	0.02
"	"	"	0.04	0.01
Pond Water	NDR	NDR	NDR	NDR

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TABLE III

Summary of Goal Residues Distribution in
Field 218127 Oakville, Iowa

Sampling Location	1st. Sampling 4/27/81	2nd Sampling 7/16/81	3rd Sampling 8/10/81	4th Sampling 9/17/81	5th Sampling 10/2/81	half life
Field	0.91	0.11	0.15	0.11	0.07	65.9
"	0.38	0.05	0.05	0.05	0.20	days
Runoff	0.25	0.12	0.02	NDR	NDR	
"	NDR	0.11	0.03	"	0.01	
Edge Pond	"	NDR	NDR	"	NDR	
"	"	"	"	"	"	
Middle Pond	Not Sampled	Not Sampled	"	"	"	
"	"	"	"	"	"	
Pond Water	NDR	NDR	"	"	"	

NDR = No Detectable Residues
Residues in ppm

Table IV

Summary of Goal Residues Distribution in
Field H79-289 Raeford, North Carolina

Sampling Location	1st Sampling 7/17/81	2nd Sampling 8/10/81	3rd Sampling 9/17/81	half life
Field	0.26	0.18	0.05	60
"	0.23	0.06	0.07	days
"	0.21	0.20	0.05	
Pond Edge	NDR	NDR	NDR	
"	NDR	"	"	
"	0.02	"	"	
Pond middle	Not Sampled	"	"	
"	"	"	"	
Pond water	NDR	"	"	

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TABLE V

Summary of Goal Residues Distribution in
Field L-75 Liddell, North Carolina

Sampling Location	1st Sampling 7/16/81	2nd Sampling 8/11/81	3rd Sampling 9/17/81
Field	0.30	0.16	0.10
"	0.08	0.11	0.19
"	0.09	0.10	0.34
Pond Edge	NDR	NDR	NDR
"	"	"	"
"	"	"	"
Pond Middle	Not sampled	"	"
"	"	"	"
"	"	"	"
Pond Water	NDR	"	"

NDR = No detectable residues
Residues in ppm

TABLE VI

Summary of Goal Residue Distribution in
Field 608113 Centralia, Missouri

Sampling Location	1st Sampling 7/17/81	2nd Sampling 7/20/81	3rd Sampling 8/13/81	4th Sampling 9/25/81	5th Sampling 11/6/81
Field	0.16	0.42	0.18	0.08	0.08
"	0.20	0.07	0.23	0.13	0.11
"	0.05	Not sampled	0.09	0.21	0.05
Runoff	NDR	NDR	NDR	0.08	NDR
"	"	"	"	NDR	0.01
"	"	Not sampled	0.01	"	NDR
Pond Soil	"	NDR	NDR	"	"
"	"	"	"	"	"
"	"	Not sampled	"	"	"
Pond Water	"	NDR	"	"	"

ROHM AND HAAS COMPANY

INDEPENDENCE MALL WEST
PHILADELPHIA, PENNSYLVANIA 19105

EPA REG. NO. 707-174-AA
EPA EST. NO. 707-PA-1



SUPPLEMENTAL LABELING FOR GOAL^R 1.6E HERBICIDE

DIRECTIONS FOR USE

CONIFER SEEDBEDS,
TRANSPLANT AND CONTAINER STOCK,
FIELD ESTABLISHMENT OF CONIFER AND HARDWOOD PLANTINGS

GENERAL INFORMATION

GOAL 1.6E is effective as a preemergence and/or postemergence herbicide for the control of certain annual grass and broadleaf weeds in conifer seedbeds, transplant and conifer stock, and field establishment of conifer and hardwood plantings. The most effective postemergence weed control is achieved when GOAL 1.6E herbicide is applied to seedling weeds less than 4 inches in height. Preemergence control is most effective when spray is applied to clean, weed-free soil surfaces. Treated soil surfaces should not be disturbed as the herbicidal effectiveness of GOAL 1.6E may be decreased. Seedling weeds are controlled during emergence as they come in contact with the soil applied herbicide.

IMPORTANT: Some varieties or cultivars of conifers, hardwood and ornamental species listed may be susceptible to GOAL 1.6E herbicide. Care should be taken to insure that the particular variety to be sprayed with GOAL 1.6E herbicide is tolerant. It is suggested that unfamiliar species be tested in limited areas prior to application for preemergence and postemergence weed control.

WEEDS CONTROLLED

When GOAL 1.6E herbicide is applied preemergence or postemergence at recommended dosages and weed stages, the following grasses and broadleaf weeds are controlled:

WEEDS CONTROLLED

*BARNYARDGRASS
BEDSTRAW, CATCHWEED
BITTERCRESS, LESSER
*BLUEGRASS, ANNUAL
BUCKWHEAT, WILD

BURCLOVER
CARPETWEED
*CHICKWEED, COMMON
*CHICKWEED, STICKY
*CLOVER, RED

*CLOVER, WHITE
COCKLEBUR, COMMON
*CRABGRASS, LARGE
*FIDDLENECK, COAST
FILAREE, BROADLEAF

Echinochloa crus-galli
Galium aparine
Cardamine oligosperma
Poa annua
Polygonum convolvulus

Medicago hispida
Mollugo verticillata
Stellaria media
Cerastium viscosum
Trifolium pratense

Trifolium repens
Xanthium pensylvanicum
Digitaria sanguinalis
Amsinckia intermedia
Erodium botrys

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FILAREE, REDSTEM
FIREWEED (FROM SEED)
FLIXWEED
*FOXTAIL, GIANT
*GOOSEGRASS

GROUNDCHERRY, CUTLEAF
GROUNDCHERRY, WRIGHT
GROUNDSEL, COMMON
HENBIT
JIMSONWEED

KNOTWEED, PROSTRATE
LADYSTHUMB
LAMBSQUARTERS, COMMON
LETTUCE, MINERS
LETTUCE, PRICKLY

MALLOW, LITTLE
MAYWEED
*MORNINGGLORY, IVYLEAF
*MORNINGGLORY, TALL
MUSTARD, BLUE

MUSTARD, TUMBLE
MUSTARD, WILD
NETTLE, BURNING
NIGHTSHADE, BLACK
NIGHTSHADE, HAIRY

OATS, WILD
ORACH, RED
PEPPERWEED, YELLOW FLOWER
PIGWEEED, PROSTRATE
PIGWEEED, REDROOT

PIMPERNEL, SCARLET
PURSLANE, COMMON
REDMAIDS
ROCKET, LONDON
SANDSPURRY, RED

*SHEPHERDSPURSE
SIDA, PRICKLY
SMARTWEED, PENNSYLVANIA
SORREL, RED (FROM SEED)
SOWTHISTLE, ANNUAL

SPEEDWELL, BIRDSEYE
**SPURGE, PROSTRATE
**SPURGE, SPOTTED
SPURRY, CORN
TANSYMUSTARD
**THISTLE, BULL
THISTLE, RUSSIAN

Erodium cicutarium
Epilobium angustifolium
Descurainia sophia
Setaria faberi
Eleusine indica

Physalis angulata
Physalis wrightii
Senecio vulgaris
Lamium amplexicaule
Datura stramonium

Polygonum aviculare
Polygonum persicaria
Chenopodium album
Montia perfoliata
Lactuca serriola

Malva parviflora
Anthemis cotula
Ipomoea hederacea
Ipomoea purpurea
Chorispora tenella

Sisymbrium altissimum
Brassica kaber
Urtica urens
Solanum nigrum
Solanum sarachoides

Avena fatua
Atriplex rosea
Lepidium perfoliatum
Amaranthus blitoides
Amaranthus retroflexus

Anagallis arvensis
Portulaca oleracea
Calandrinia caulescens
Sisymbrium irio
Spergularia rubra

Capsella bursa-pastoris
Sida spinosa
Polygonum pensylvanicum
Rumex acetosella
Sonchus oleraceus

Veronica persica
Euphorbia supina
Euphorbia maculata
Spergula arvensis
Descurainia pinnata
Cirsium vulgare
Salsola kali

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VELVETLEAF
WITCHGRASS
**WOODSORREL, YELLOW

Abutilon theophrasti
Panicum capillare
Oxalis stricta

*Highest rate and/or multiple applications
may be required for acceptable control
**Preemergence control only

GOAL 1.6E herbicide is most effective when applied preemergence to annual grasses. Postemergence applications should be made to seedling grasses not exceeding the 2-leaf stage. The addition of 0.25% (2 pints/100 gallons of spray solution) of TRITON AG-98 or comparable 80% active nonionic surfactant, cleared for application on growing crops, enhances the GOAL 1.6E herbicide activity on emerged weeds.

CONIFER SEEDBEDS

To assist in the establishment of conifer seedbeds, a preemergence application should be made after seeding but prior to conifer emergence. Postemergence applications should not be made until a minimum of 5 weeks after emergence of the conifer seedlings. Additional care should be taken if cool, cloudy weather occurs during emergence to make certain that seedlings have hardened off prior to spraying.

Conifers are tolerant to preemergence and postemergence applications of GOAL 1.6E herbicide. Applied postemergence, GOAL 1.6E herbicide will provide both postemergence and residual preemergence control of many broadleaf weeds and annual grass species.

CONIFER SPECIES

GOAL 1.6E herbicide may be applied to conifer seedbeds of numerous species including the following:

DOUGLAS-FIR

Pseudotsuga menziesii

FIR
GRAND
FRASER
NOBLE

Abies grandis
Abies fraseri
Abies procera

HEMLOCK
EASTERN HEMLOCK

Tsuga canadensis

PINE
AUSTRIAN
EASTERN WHITE
JACK
HIMALAYAN
LOBLOLLY
LODGEPOLE
LONGLEAF
MONTEREY
MUGHO
PONDEROSA

Pinus nigra
Pinus strobus
Pinus banksiana
Pinus graffithii
Pinus taeda
Pinus contorta
Pinus palustris
Pinus radiata
Pinus mugo
Pinus ponderosa

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PINE
SCOTCH
SHORTLEAF
SLASH
VIRGINIA

Pinus sylvestris
Pinus echinata
Pinus elliottii
Pinus virginiana

SPRUCE
BLUE
DWARF ALBERTA
NORWAY
SITKA

Picea pungens
Picea glauca conica
Picea abies
Picea sitchensis

PREEMERGENCE DOSAGE

Apply 1.25 to 5 pints (0.25 to 1.0 lb. active) of GOAL 1.6E herbicide per broadcast acre as a preemergence application. Where grassy weeds are present, a minimum rate of 2.5 pints (0.5 lb. active) of GOAL 1.6E herbicide per broadcast acre is suggested. In known areas of high weed competition, 5 pints (1.0 lb. active) of GOAL 1.6E herbicide per broadcast acre are recommended.

TIMING AND METHOD OF APPLICATION

Apply recommended dosage after seeding but prior to conifer emergence. GOAL 1.6E herbicide should be thoroughly mixed with clean water at recommended concentration and applied at 20 to 40 psi in a minimum of 20 gallons of water per treated acre. Broadcast to beds and irrigate prior to weed emergence with 1/2 to 3/4 inch of sprinkler irrigation.

POSTEMERGENCE DOSAGE

Apply 1.25 to 2.5 pints (0.25 to 0.5 lb. active) of GOAL 1.6E herbicide per broadcast acre with each postemergence application. Two or three postemergence applications may be necessary for season-long weed control.

TIMING AND METHOD OF APPLICATION

Apply recommended dosage to seedbeds no sooner than 5 weeks after emergence of conifer seedlings. Additional care should be taken if cool, cloudy weather occurs during emergence to make certain that seedlings have hardened off prior to spraying. Application should be made to seedling weeds (less than 4 inches in height). GOAL 1.6E herbicide should be thoroughly mixed with clean water at recommended concentration and applied as a broadcast application at 20 to 40 psi in a minimum of 20 gallons of water per treated acre.

CONIFER TRANSPLANTS AND CONTAINER STOCK (includes 2-0 seedling and Christmas tree plantings)

Many container grown conifers and conifer transplants are tolerant to preemergence and postemergence applications of GOAL 1.6E herbicide. Applied postemergence, GOAL 1.6E herbicide will provide both postemergence and preemergence control of many broadleaf weeds and grasses. Postemergence applications should be applied before bud break or after foliage has had an opportunity to harden off. Conifers may be transplanted from seedbeds and sprayed directly providing bud break has not occurred.

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The following conifer species in addition to species listed under the "Conifer Seedbed" section have been shown to be tolerant to GOAL 1.6E herbicide.

ARBORVITAE

Thuja occidentalis
Thuja orientalis

JUNIPER

Juniperus chinensis
Juniperus horizontalis
Juniperus procumbens
Juniperus sabina
Juniperus scopulum

RED CEDAR

Juniperus virginiana

WESTERN HEMLOCK

Tsuga heterophylla

YEW

Taxus species

DOSAGE

For preemergence or postemergence weed control apply 5 to 10 pints (1.0 to 2.0 lb. active) of GOAL 1.6E herbicide per broadcast acre.

TIMING AND METHOD OF APPLICATION

For optimum weed control, preemergence applications should be made immediately after transplanting seedlings or to weed-free container stock. Postemergence applications should be made to weeds less than 4 inches in height. Two applications may be necessary in fall transplanted conifer fields for season-long weed control. The addition of 0.25% (2 pints/100 gals. of spray solution) of TRITON AG-98 or comparable 80% active nonionic surfactant, cleared for application to growing crops, enhances GOAL 1.6E herbicide activity on emerged weeds. GOAL 1.6E herbicide must be applied only to conifer transplants prior to budbreak or after foliage has had an opportunity to harden off. Thoroughly mix with clean water at recommended concentration and apply at 20 to 40 psi in a minimum of 20 gallons of water per treated acre. Spray over the top of transplants. Heavy rainfall immediately following application to emerged weeds may reduce effectiveness.

FIELD ESTABLISHMENT OF CONIFER AND HARDWOODS

GOAL 1.6E herbicide may be applied to assist in field establishment of many conifer and hardwood species. GOAL 1.6E herbicide should be applied only to sites that have been intensively prepared. For optimum preemergence activity, the soil surface should be smooth and free of crop and weed residue (leaves, clippings, weeds, etc.).

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Conifers

GOAL 1.6E herbicide can be applied over the top of established or seedling conifers. Postemergence applications should be applied prior to bud break or after the foliage has had an opportunity to harden off. GOAL 1.6E herbicide may be applied to assist in field establishment of conifer species listed under the "Conifer Seedbed" section.

Hardwoods

GOAL 1.6E herbicide has exhibited selectivity to the following hardwood species when applied as a post-directed spray prior to bud break. Special care should be taken to direct the spray toward the base of the plant. Applications made after budbreak may result in injury to the hardwood species and are not recommended.

ASH
MAPLE, BLACK
OAK, NORTHERN RED
OLIVE, RUSSIAN
POPLAR (COTTONWOOD)
SWEETGUM
SYCAMORE
WALNUT, BLACK

Fraxinus spp.
Acer nigrum
Quercus rubra
Elaeagnus angustifolia
Populus spp.
Liquidambar styraciflua
Platanus occidentalis
Juglans nigra

DOSAGE

Apply 5 to 10 pints (1.0 to 2.0 lbs. active) of GOAL 1.6E herbicide per broadcast acre for preemergence and postemergence weed control.

For banded application, the amount of GOAL 1.6E herbicide used per acre should be reduced according to the following formula:

$$\frac{\text{Band width (in.)}}{\text{Row width (in.)}} \times \text{Rate per Acre Broadcast} = \text{Amount Needed per Acre For Banded Application}$$

TIMING AND METHOD OF APPLICATION

Preemergence applications should be made immediately after transplanting seedlings or to established conifers or dormant hardwoods. Applications to conifer or hardwood species should be made prior to bud break. Postemergence applications may be made to conifers after the new growth has had an opportunity to harden off.

For optimum weed control, GOAL 1.6E herbicide should be applied prior to weed emergence. Postemergence applications should be applied to seedling weeds (less than 4 inches in height). Applications must be made in a manner consistent with that previously detailed under "Conifers" and "Hardwoods" found in this section. Thoroughly mix with clean water at recommended concentrations and apply at 20 to 40 psi in a minimum of 20 gallons of water per treated acre. Heavy rainfall immediately following application to emerged weeds may reduce effectiveness.

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TANK MIXING

GOAL 1.6E herbicide is compatible with atrazine, hexazinone, glyphosate, paraquat and simazine. When tank mixing GOAL 1.6E herbicide with another pesticide, always follow the most restrictive label language when complying with the use restriction and limitations on all labels. DO NOT apply a tank mixture of GOAL 1.6E herbicide plus glyphosate over the top of conifers, as injury may result.

SPECIFIC USE RESTRICTIONS - GOAL 1.6E HERBICIDE

The following specific use restrictions should be observed when GOAL 1.6E herbicide is used as recommended on this label.

- . Follow General Use Restrictions listed on the GOAL 1.6E herbicide label.
- . Do not tank mix GOAL 1.6E herbicide with glyphosate when application is to be made over the top of conifers.
- . Do not apply GOAL herbicide in an enclosed greenhouse structure as injury to plant foliage may result.
- . Do not store or transport treated container stock in an enclosed structure until completion of 4 irrigations (minimum 21 days) as injury to non labeled plants may occur.
- . Always apply GOAL 1.6E herbicide only to healthy conifer and hardwood stock. Do not apply GOAL 1.6E herbicide to hardwood or conifers which are under stress from excessive fertilizer or soil salts, disease, nematodes, frost, drought, flooding, previously applied pesticides, soil insects, or winter injury, as severe injury may result.

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ROHM AND HAAS COMPANY

INDEPENDENCE MALL WEST

PHILADELPHIA, PENNSYLVANIA 19105

EPA REG. NO. 707-145-AA
EPA EST. NO. 707-PA-1



SUPPLEMENTAL LABELING FOR GOAL^R 2E HERBICIDE

DIRECTIONS FOR USE

CONIFER SEEDBEDS,
TRANSPLANT AND CONTAINER STOCK,
FIELD ESTABLISHMENT OF CONIFER AND HARDWOOD PLANTINGS

GENERAL INFORMATION

GOAL 2E is effective as a preemergence and/or postemergence herbicide for the control of certain annual grass and broadleaf weeds in conifer seedbeds, transplant and conifer stock, and field establishment of conifer and hardwood plantings. The most effective postemergence weed control is achieved when GOAL 2E herbicide is applied to seedling weeds less than 4 inches in height. Preemergence control is most effective when spray is applied to clean, weed-free soil surfaces. Treated soil surfaces should not be disturbed as the herbicidal effectiveness of GOAL 2E may be decreased. Seedling weeds are controlled during emergence as they come in contact with the soil applied herbicide.

IMPORTANT: Some varieties or cultivars of conifers, hardwood and ornamental species listed may be susceptible to GOAL 2E herbicide. Care should be taken to insure that the particular variety to be sprayed with GOAL 2E herbicide is tolerant. It is suggested that unfamiliar species be tested in limited areas prior to application for preemergence and postemergence weed control.

WEEDS CONTROLLED

When GOAL 2E herbicide is applied preemergence or postemergence at recommended dosages and weed stages, the following grasses and broadleaf weeds are controlled:

WEEDS CONTROLLED

*BARNYARDGRASS
BEDSTRAW, CATCHWEED
BITTERCRESS, LESSER
*BLUEGRASS, ANNUAL
BUCKWHEAT, WILD

BUR CLOVER
CARPETWEED
*CHICKWEED, COMMON
*CHICKWEED, STICKY
*CLOVER, RED

*CLOVER, WHITE
COCKLEBUR, COMMON
*CRABGRASS, LARGE
*FIDDLENECK, COAST
FILAREE, BROADLEAF

Echinochloa crus-galli
Galium aparine
Cardamine oligosperma
Poa annua
Polygonum convolvulus

Medicago hispida
Mollugo verticillata
Stellaria media
Cerastium viscosum
Trifolium pratense

Trifolium repens
Xanthium pensylvanicum
Digitaria sanguinalis
Amsinckia intermedia
Erodium botrys

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FILAREE, REDSTEM
FIREWEED (FROM SEED)
FLIXWEED
*FOXTAIL, GIANT
*GOOSEGRASS

GROUNDCHERRY, CUTLEAF
GROUNDCHERRY, WRIGHT
GROUNDSEL, COMMON
HENBIT
JIMSONWEED

KNOTWEED, PROSTRATE
LADYSTHUMB
LAMBSQUARTERS, COMMON
LETTUCE, MINERS
LETTUCE, PRICKLY

MALLOW, LITTLE
MAYWEED
*MORNINGGLORY, IVYLEAF
*MORNINGGLORY, TALL
MUSTARD, BLUE

MUSTARD, TUMBLE
MUSTARD, WILD
NETTLE, BURNING
NIGHTSHADE, BLACK
NIGHTSHADE, HAIRY

OATS, WILD
ORACH, RED
PEPPERWEED, YELLOW FLOWER
PIGWEEED, PROSTRATE
PIGWEEED, REDROOT

PIMPERNEL, SCARLET
PURSLANE, COMMON
REDMAIDS
ROCKET, LONDON
SANDSPURRY, RED

*SHEPHERDSPURSE
SIDA, PRICKLY
SMARTWEED, PENNSYLVANIA
SORREL, RED (FROM SEED)
SOWTHISTLE, ANNUAL

SPEEDWELL, BIRDSEYE
**SPURGE, PROSTRATE
**SPURGE, SPOTTED
SPURRY, CORN
TANSYMUSTARD
**THISTLE, BULL
THISTLE, RUSSIAN

Erodium cicutarium
Epilobium angustifolium
Descurainia sophia
Setaria faberi
Eleusine indica

Physalis angulata
Physalis wrightii
Senecio vulgaris
Lamium amplexicaule
Datura stramonium

Polygonum aviculare
Polygonum persicaria
Chenopodium album
Montia perfoliata
Lactuca serriola

Malva parviflora
Anthemis cotula
Ipomoea hederacea
Ipomoea purpurea
Chorisporea tenella

Sisymbrium altissimum
Brassica kaber
Urtica urens
Solanum nigrum
Solanum sarachoides

Avena fatua
Atriplex rosea
Lepidium perfoliatum
Amaranthus blitoides
Amaranthus retroflexus

Anagallis arvensis
Portulaca oleracea
Calandrinia caulescens
Sisymbrium irio
Spergularia rubra

Capsella bursa-pastoris
Sida spinosa
Polygonum pennsylvanicum
Rumex acetosella
Sonchus oleraceus

Veronica persica
Euphorbia supina
Euphorbia maculata
Spergula arvensis
Descurainia pinnata
Cirsium vulgare
Salsola kali

VELVETLEAF
WITCHGRASS
**WOODSORREL, YELLOW

Abutilon theophrasti
Panicum capillare
Oxalis stricta

*Highest rate and/or multiple applications
may be required for acceptable control
**Preemergence control only

GOAL 2E herbicide is most effective when applied preemergence to annual grasses. Postemergence applications should be made to seedling grasses not exceeding the 2-leaf stage. The addition of 0.25% (2 pints/100 gallons of spray solution) of TRITON AG-98 or comparable 80% active nonionic surfactant, cleared for application on growing crops, enhances the GOAL 2E herbicide activity on emerged weeds.

CONIFER SEEDBEDS

To assist in the establishment of conifer seedbeds, a preemergence application should be made after seeding but prior to conifer emergence. Postemergence applications should not be made until a minimum of 5 weeks after emergence of the conifer seedlings. Additional care should be taken if cool, cloudy weather occurs during emergence to make certain that seedlings have hardened off prior to spraying.

Conifers are tolerant to preemergence and postemergence applications of GOAL 2E herbicide. Applied postemergence, GOAL 2E herbicide will provide both postemergence and residual preemergence control of many broadleaf weeds and annual grass species.

CONIFER SPECIES

GOAL 2E herbicide may be applied to conifer seedbeds of numerous species including the following:

DOUGLAS-FIR

Pseudotsuga menziesii

FIR

GRAND
FRASER
NOBLE

Abies grandis
Abies fraseri
Abies procera

HEMLOCK

EASTERN HEMLOCK

Tsuga canadensis

PINE

AUSTRIAN
EASTERN WHITE
JACK
HIMALAYAN
LOBLOLLY
LODGEPOLE
LONGLEAF
MONTEREY
MUGHO
PONDEROSA

Pinus nigra
Pinus strobus
Pinus banksiana
Pinus graffithii
Pinus taeda
Pinus contorta
Pinus palustris
Pinus radiata
Pinus mugo
Pinus ponderosa

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PINE

SCOTCH

SHORTLEAF

SLASH

VIRGINIA

Pinus sylvestris

Pinus echinata

Pinus elliotii

Pinus virginiana

SPRUCE

BLUE

DWARF ALBERTA

NORWAY

SITKA

Picea pungens

Picea glauca conica

Picea abies

Picea sitchensis

PREEMERGENCE DOSAGE

Apply 0.5 to 2 quarts (0.25 to 1.0 lb. active) of GOAL 2E herbicide per broadcast acre as a preemergence application. Where grassy weeds are present, a minimum rate of 1.0 quart (0.5 lb. active) of GOAL 2E herbicide per broadcast acre is suggested. In known areas of high weed competition, 2.0 quarts (1.0 lb. active) of GOAL 2E herbicide per broadcast acre are recommended.

TIMING AND METHOD OF APPLICATION

Apply recommended dosage after seeding but prior to conifer emergence. GOAL 2E herbicide should be thoroughly mixed with clean water at recommended concentration and applied at 20 to 40 psi in a minimum of 20 gallons of water per treated acre. Broadcast to beds and irrigate prior to weed emergence with 1/2 to 3/4 inch of sprinkler irrigation.

POSTEMERGENCE DOSAGE

Apply 0.5 to 1.0 quart (0.25 to 0.5 lb. active) of GOAL 2E herbicide per broadcast acre with each postemergence application. Two or three postemergence applications may be necessary for season-long weed control.

TIMING AND METHOD OF APPLICATION

Apply recommended dosage to seedbeds no sooner than 5 weeks after emergence of conifer seedlings. Additional care should be taken if cool, cloudy weather occurs during emergence to make certain that seedlings have hardened off prior to spraying. Application should be made to seedling weeds (less than 4 inches in height). GOAL 2E herbicide should be thoroughly mixed with clean water at recommended concentration and applied as a broadcast application at 20 to 40 psi in a minimum of 20 gallons of water per treated acre.

CONIFER TRANSPLANTS AND CONTAINER STOCK (includes 2-0 seedling and Christmas tree plantings)

Many container grown conifers and conifer transplants are tolerant to preemergence and postemergence applications of GOAL 2E herbicide. Applied postemergence, GOAL 2E herbicide will provide both postemergence and preemergence control of many broadleaf weeds and grasses. Postemergence applications should be applied before bud break or after foliage has had an opportunity to harden off. Conifers may be transplanted from seedbeds and sprayed directly providing bud break has not occurred.

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The following conifer species in addition to species listed under the "Conifer Seedbed" section have been shown to be tolerant to GOAL 2E herbicide.

ARBORVITAE

Thuja occidentalis
Thuja orientalis

JUNIPER

Juniperus chinensis
Juniperus horizontalis
Juniperus procumbens
Juniperus sabina
Juniperus scopulum

RED CEDAR

Juniperus virginiana

WESTERN HEMLOCK

Tsuga heterophylla

YEW

Taxus species

DOSAGE

For preemergence or postemergence weed control apply 2.0 to 4.0 quarts (1.0 to 2.0 lb. active) of GOAL 2E herbicide per broadcast acre.

TIMING AND METHOD OF APPLICATION

For optimum weed control, preemergence applications should be made immediately after transplanting seedlings or to weed-free container stock. Postemergence applications should be made to weeds less than 4 inches in height. Two applications may be necessary in fall transplanted conifer fields for season-long weed control. The addition of 0.25% (2 pints/100 gals. of spray solution) of TRITON AG-98 or comparable 80% active nonionic surfactant, cleared for application on growing crops, enhances GOAL 2E herbicide activity on emerged weeds. GOAL 2E herbicide must be applied only to conifer transplants prior to budbreak or after foliage has had an opportunity to harden off. Thoroughly mix with clean water at recommended concentration and apply at 20 to 40 psi in a minimum of 20 gallons of water per treated acre. Spray over the top of transplants. Heavy rainfall immediately following application to emerged weeds may reduce effectiveness.

Added

FIELD ESTABLISHMENT OF CONIFER AND HARDWOODS

GOAL 2E herbicide may be applied to assist in field establishment of many conifer and hardwood species. GOAL 2E herbicide should be applied only to sites that have been intensively prepared. For optimum preemergence activity, the soil surface should be smooth and free of crop and weed residue (leaves, clippings, weeds, etc.).

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Conifers

GOAL 2E herbicide can be applied over the top of established or seedling conifers. Postemergence applications should be applied prior to bud break or after the foliage has had an opportunity to harden off. GOAL 2E herbicide may be applied to assist in field establishment of conifer species listed under the "Conifer Seedbed" section.

Hardwoods

GOAL 2E herbicide has exhibited selectivity to the following hardwood species when applied as a post-directed spray prior to bud break. Special care should be taken to direct the spray toward the base of the plant. Applications made after budbreak may result in injury to the hardwood species and are not recommended.

ASH	Fraxinus spp.
MAPLE, BLACK	Acer nigrum
OAK, NORTHERN RED	Quercus rubra
OLIVE, RUSSIAN	Elaeagnus angustifolia
POPLAR (COTTONWOOD)	Populus spp.
SWEETGUM	Liquidambar styraciflua
SYCAMORE	Platanus occidentalis
WALNUT, BLACK	Juglans nigra

DOSAGE

Apply 2.0 to 4.0 quarts (1.0 to 2.0 lbs. active) of GOAL 2E herbicide per broadcast acre for preemergence and postemergence weed control.

For banded application, the amount of GOAL 2E herbicide used per acre should be reduced according to the following formula:

$$\frac{\text{Band width (in.)}}{\text{Row width (in.)}} \times \text{Rate per Acre Broadcast} = \text{Amount Needed per Acre For Banded Application}$$

TIMING AND METHOD OF APPLICATION

Preemergence applications should be made immediately after transplanting seedlings or to established conifers or dormant hardwoods. Applications to conifer or hardwood species should be made prior to bud break. Postemergence applications may be made to conifers after the new growth has had an opportunity to harden off.

For optimum weed control, GOAL 2E herbicide should be applied prior to weed emergence. Postemergence applications should be applied to seedling weeds (less than 4 inches in height). Applications must be made in a manner consistent with that previously detailed under "Conifers" and "Hardwoods" found in this section. Thoroughly mix with clean water at recommended concentrations and apply at 20 to 40 psi in a minimum of 20 gallons of water per treated acre. Heavy rainfall immediately following application to emerged weeds may reduce effectiveness.

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TANK MIXING

GOAL 2E herbicide is compatible with atrazine, hexazinone, glyphosate, paraquat and simazine. When tank mixing GOAL 2E herbicide with another pesticide, always follow the most restrictive label language when complying with the use restriction and limitations on all labels. DO NOT apply a tank mixture of GOAL 2E herbicide plus glyphosate over the top of conifers, as injury may result.

SPECIFIC USE RESTRICTIONS - GOAL 2E HERBICIDE

The following specific use restrictions should be observed when GOAL 2E herbicide is used as recommended on this label.

- . Do not tank mix GOAL 2E herbicide with glyphosate when application is to be made over the top of conifers.
- . Do not apply GOAL herbicide in an enclosed greenhouse structure as injury to plant foliage may result.
- . Do not store or transport treated container stock in an enclosed structure until completion of 4 irrigations (minimum 21 days) as injury to non-labeled plants may occur.
- . Read and observe all label directions before using. When tank mixing, always read all individual manufacturer's labels. In interpreting all labels for the tank mixture, the most restrictive situations must apply.
- . Do not contaminate irrigation water or water used for domestic purposes.
- . Do not use any plants treated with GOAL 2E herbicide for feed or forage.
- . Do not feed or graze animals on any areas treated with GOAL 2E herbicide.
- . Do not treat ditch banks or waterways with GOAL 2E herbicide.
- . Use GOAL 2E herbicide only for recommended purposes and at recommended rates.
- . Do not apply when weather conditions favor drift. Avoid drift to all non-target areas. GOAL 2E herbicide is phytotoxic to plant foliage.
- . Thoroughly flush spray equipment (tank, pump, hoses and boom) with clean water before and after each use. Residual GOAL 2E herbicide remaining in spray tank may damage other crops. To assist removal of GOAL 2E herbicide residues in spray equipment, TRITON AG-98 or TRITON CS-7 may be added at the rate of 1 quart per 100 gallons of water during flushing.
- . Always apply GOAL 2E herbicide only to healthy conifer and hardwood stock. Do not apply GOAL 2E herbicide to hardwood or conifers which are under stress from excessive fertilizer or soil salts, disease, frost, drought, nematodes, flooding, previously applied pesticides, soil insects or winter injury, as severe injury may result.

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- GOAL 2E herbicide should be applied only by ground application equipment except as specifically directed on this label or on other approved Rohm and Haas Company Supplemental labeling.

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